FAIRCHILD
A Schlumberger Company

PN/MPS/FTSO3638
PN/MPS/FTSO3638A

T-37-15

PNP Small Signal General Purpose Amplifiers & Switches

- V_{CEO} ... **-25 V (Min)**
- h_{FE} ... **30 (Min) (PN/MPS/FTSO3638), 100 (Min) (PN/MPS/FTSO3638A) @ 50 mA**
- t_{on} ... **75 ns (Max) @ 300 mA; t_{off} ... 170 ns (Max) @ 300 mA**
- **Complements ... PN3641, PN3643**

PACKAGE

PN3638	TO-92
PN3638A	TO-92
MPS3638	TO-92
MPS3638A	TO-92
FTSO3638	TO-236AA/AB
FTSO3638A	TO-236AA/AB

ABSOLUTE MAXIMUM RATINGS (Note 1)

Temperatures

Storage Temperature	-55° C to 150° C
Operating Junction Temperature	150° C

Power Dissipation (Notes 2 & 3)

Total Dissipation at	PN/MPS	FTSO
25° C Ambient Temperature	0.625 W	0.350 W*
25° C Case Temperature	1.0 W	

Voltages & Currents

V_{CEO}	Collector to Emitter Voltage (Note 4)	−25 V
V_{CBO}	Collector to Base Voltage	−25 V
V_{CES}	Collector to Emitter Voltage	−25 V
V_{EBO}	Emitter to Base Voltage	−4.0 V
I_C	Collector Current (Note 2)	500 mA

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	3638 MIN	3638 MAX	3638A MIN	3638A MAX	UNITS	TEST CONDITIONS
BV_{CES}	Collector to Emitter Breakdown Voltage	−25		−25		V	I_C = 100 μA, V_{BE} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−25		−25		V	I_C = 100 μA, V_{BE} = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	|4.0		−4.0		V	I_E = 100 μA, I_C = 0
I_{CES}	Collector Reverse Current		35 2.0		35 2.0	nA μA	V_{CE} = −15 V, V_{BE} = 0 V_{CE} = −15 V, V_{BE} = 0, T_A = 65° C

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150° C and (TO-92) junction-to-case thermal resistance of 125° C/W (derating factor of 8 0 mW/° C); junction-to-ambient thermal resistance of 200° C/W (derating factor of 5.0 mW/° C); (TO-236) junction-to-ambient thermal resistance of 357° C/W (derating factor of 2.8 mW/° C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Curve Set T212.

* Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

PN/MPS/FTSO3638
PN/MPS/FTSO3638A

T-37-15

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	3638 MIN	3638 MAX	3638A MIN	3638A MAX	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5) (MPS3638)	20					I_C = 10 mA, V_{CE} = −10 V
				100			I_C = 10 mA, V_{CE} = −10 V
				80			I_C = 1.0 mA, V_{CE} = −10 V
		30		100			I_C = 50 mA, V_{CE} = −1.0 V
		20		20			I_C = 300 mA, V_{CE} = −2.0 V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 & 5)	−25		−25		V	I_C = 10 mA, I_B = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Pulsed) (Note 5)		−0.25		−0.25	V	I_C = 50 mA, I_B = 2.5 mA1
			−1.0		−1.0	V	I_C = 300 mA, I_B = 30 mA
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)		−1.1		−1.1	V	I_C = 50 mA, I_B = 2.5 mA
		−0.8	−2.0	−0.8	−2.0	V	I_C = 300 mA, I_B = 30 mA
C_{ob}	Common Base Open Circuit, Output Capacitance		20		10	pF	V_{CB} = −10 V, I_E = 0, f = 140 kHz
C_{ib}	Common Base Open Circuit, Input Capacitance (PN3638A)				35	pF	V_{EB} = −0.5 V, I_C = 0, f = 140 kHz
	(MPS3638A)		65		25	pF	V_{EB} = −0.5 V, I_C = 0, f = 140 kHz
h_{fe}	Magnitude of Small Signal Current Gain	1.0		1.5			I_C = 50 mA, V_{CE} = −3.0 V, f = 100 MHz
h_{fe}	Small Signal Current Gain (PN3638)	25					I_C = 10 mA, V_{CE} = −10 V, f = 1.0 kHz
	(MPS3638)	25	180				I_C = 10 mA, V_{CE} = −10 V, f = 1.0 kHz
				100			I_C = 10 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{ie}	Input Resistance		2000		2000	Ω	I_C = 10 mA, V_{CE} = 10 V,
	(MPS3638)		1500			Ω	f = 1.0 kHz
h_{oe}	Output Conductance		1200		1200	μmhos	I_C = 10 mA, V_{CE} = −10 V, f = 1.0 kHz
h_{re}	Voltage Feedback Ratio		2600		1500	x10-6	I_C = 10 mA, V_{CE} = −10 V, f = 1.0 kHz
t_{on}	Turn On Time (test circuit no. 536)		75		75	ns	$I_C \approx$ 300 mA, $I_{B1} \approx$ 30 mA, V_{CC} = 10 V
t_{off}	Turn Off Time (test circuit no. 536)		170		170	ns	$I_C \approx$ 300 mA, $I_{B1} \approx I_{B2} \approx$ 30 mA, V_{CC} = 10 V

PN/MPS/FTSO3639
PN/MPS/FTSO3640

PNP High Speed Saturated Logic Switches

T-37-15

- **V_{CEO} ... 12 V (Min) (PN/MPS3640)**
- **t_{on} ... 25 ns (Max) @ 50 mA, 60 ns (Max) @ 10 mA; t_{off} ... 35 ns (Max) @ 50 mA, 75 ns (Max) @ 10 mA**
- **Complements ... PN4274, 2N5769**

PACKAGE

PN3639	TO-92
PN3640	TO-92
MPS3639	TO-92
MPS3640	TO-92
FTSO3639	TO-236AA/AB
FTSO3640	TO-236AA/AB

ABSOLUTE MAXIMUM RATINGS (Note 1)

Temperatures

Storage Temperature	−55° C to 150° C
Operating Junction Temperature	150° C

Power Dissipation (Notes 2 & 3)

Total Dissipation at	PN/MPS	FTSO
25° C Ambient Temperature	0.625 W	0.350 W*
25° C Case Temperature	1.0 W	

Voltages & Currents		**3639**	**3640**
V_{CEO}	Collector to Emitter Voltage (Note 4)	−6 V	−12 V
V_{CBO}	Collector to Base Voltage	−6 V	−12 V
V_{EBO}	Emitter to Base Voltage	−4.0 V	−4.0 V
I_C	Collector Current	80 mA	80 mA

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	PN3639 MIN	PN3639 MAX	PN3640 MIN	PN3640 MAX	UNITS	TEST CONDITIONS
BV_{CES}	Collector to Emitter Breakdown Voltage	−6.0		−12.0		V	I_C = 100 μA, V_{BE} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−6.0		−12.0		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.0		−4.0		V	I_E = 100 μA, I_C = 0
I_{CES}	Collector Reverse Current		50			nA	V_{CE} = −3.0 V, V_{BE} = 0
					50	nA	V_{CE} = −6.0 V, V_{BE} = 0
			1.0			μA	V_{CE} = −3.0 V, V_{BE} = 0, T_A = 65° C
					1.0	μA	V_{CE} = −6.0 V, V_{BE} = 0, T_A = 65° C
h_{FE}	DC Pulse Current Gain (Note 5)	30 20	120	30 20	120		I_C = 10 mA, V_{CE} = −0.3 V I_C = 50 mA, V_{CE} = −1.0 V

NOTES:

1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150° C and (TO-92) junction-to-case thermal resistance of 125° C/W (derating factor of 8.0 mW/° C); junction-to-ambient thermal resistance of 200° C/W (derating factor of 5.0 mW/° C); (TO-236) junction-to-ambient thermal resistance of 357° C/W (derating factor of 2.8 mW/° C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Curve Set T292.

* Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

PN/MPS/FTSO3639
PN/MPS/FTSO3640 T-37-15

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	PN3639 MIN	PN3639 MAX	PN3640 MIN	PN3640 MAX	UNITS	TEST CONDITIONS
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	−6.0		−12		V	I_C = 10 mA, I_B = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 4)		−0.16 −0.5 −0.25 −0.23		−0.2 −0.6 −0.3 −0.25	V V V V	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA I_C = 10 mA, I_B = 0.5 mA I_C = 10 mA, I_B = 1.0 mA, T_A = 65° C
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)	−0.75 −0.8	−0.95 −1.0 1.5	−0.75 −0.8	−0.95 −1.0 1.5	V V V	I_C = 10 mA, I_B = 0.5 mA I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA
C_{ob}	Output Capacitance		3.5 5.5		3.5 5.5	pF pF	V_{CB} = −5.0 V, I_E = 0, f = 140 kHz V_{CB} = 0, I_E = 0, f = 140 kHz
C_{ib}	Input Capacitance		3.5		3.5	pF	V_{EB} = −0.5 V, I_C = 0, f = 140 kHz
h_{fe}	High Frequency Current Gain	3.0 5.0		3.0 5.0			I_C = 10 mA, V_{CB} = 0, f = 100 MHz I_C = 10 mA, V_{CE} = −5.0 V, f = 100 MHz
τ_s	Storage Time (test circuit no. 234)		30		50	ns	$I_C \simeq$ 10 mA, $I_{B1} \simeq I_{B2} \simeq$ 10 mA, V_{CC} = 3.0 V
t_{on}	Turn On Time (test circuit no. 235) (test circuit no. 219)		25 60		25 60	ns ns	$I_C \simeq$ 50 mA, $I_{B1} \simeq$ 5.0 mA, V_{CC} = 6.0 V $I_C \simeq$ 10 mA, $I_{B1} \simeq$ 0.5 mA, V_{CC} = −1.5 V
t_{off}	Turn Off Time (test circuit no. 235) (test circuit no. 219)		25 60		35 75	ns ns	$I_C \simeq$ 50 mA, $I_{B1} \simeq I_{B2} \simeq$ 5.0 mA, V_{CC} = 6.0 V $I_C \simeq$ 10 mA, $I_{B1} \simeq I_{B2} \simeq$ 0.5 mA, V_{CC} = 1.5 V

SYMBOL	CHARACTERISTIC	MPS3639 MIN	MPS3639 MAX	MPS3640 MIN	MPS3640 MAX	UNITS	TEST CONDITIONS
BV_{CES}	Collector to Emitter Breakdown Voltage	−6.0		−12.0		V	I_C = 100 μA, V_{BE} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	−6.0		−12.0		V	I_C = 100 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.0		−4.0		V	I_E = 100 μA, I_C = 0
I_{CES}	Collector Reverse Current		10 1.0		 10 1.0	nA nA μA μA	V_{CE} = −3.0 V, V_{BE} = 0 V_{CE} = −6.0 V, V_{BE} = 0 V_{CE} = −3.0 V, V_{BE} = 0, T_A = 65° C V_{CE} = −6.0 V, V_{BE} = 0, T_A = 65° C

SYMBOL	CHARACTERISTIC	MPS3639 MIN	MPS3639 MAX	MPS3640 MIN	MPS3640 MAX	UNITS	TEST CONDITIONS
h_{FE}	DC Pulse Current Gain (Note 5)	30 20	120	30 20	120		I_C = 10 mA, V_{CE} = −0.3 V I_C = 50 mA, V_{CE} = −1.0 V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Note 5)	−6.0		−12		V	I_C = 10 mA, I_B = 0
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		−0.16 −0.5 −0.23		−0.2 −0.6 −0.25	V V V	I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA I_C = 10 mA, I_B = 1.0 mA, T_A = 65° C
$V_{BE(sat)}$	Base to Emitter Saturation Voltage (Note 5)	−0.75 −0.8	−0.95 −1.0 1.5	−0.75 −0.8	−0.95 −1.0 1.5	V V V	I_C = 10 mA, I_B = 0.5 mA I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA
C_{ob}	Output Capacitance		3.5		3.5	pF	V_{CB} = −5.0 V, I_E = 0, f = 140 kHz
C_{ib}	Input Capacitance		3.5		3.5	pF	V_{EB} = −0.5 V, I_C = 0, f = 140 kHz
h_{fe}	High Frequency Current Gain	3.0 5.0		 5.0			I_C = 10 mA, V_{CB} = 0, f = 100 MHz I_C = 10 mA, V_{CE} = −5.0, f = 100 MHz
t_{on}	Turn On Time (test circuit no. 235) (test circuit no. 219)		25 60		25 60	ns ns	$I_C \simeq$ 50 mA, $I_{B1} \simeq$ 5.0 mA, V_{CC} = 6.0 V $I_C \simeq$ 10 mA, $I_{B1} \simeq$ 0.5 mA, V_{CC} = −1.5 V
t_{off}	Turn Off Time (test circuit no. 235) (test circuit no. 219)		25 60		35 75	ns ns	$I_C \simeq$ 50 mA, $I_{B1} \simeq I_{B2} \simeq$ 5.0 mA, V_{CC} = −6.0 V $I_C \simeq$ 10 mA, $I_{B1} \simeq I_{B2} \simeq$ 0.5 mA, V_{CC} = 1.5 V

FAIRCHILD
A Schlumberger Company

PN3641/FTSO3641
PN3642/FTSO3642
PN3643/FTSO3643

T-29-23

NPN General Purpose Small Signal Amplifiers

- V_{CEO} ... 30 V (Min) (PN/FTSO3641, PN/FTSO3643), 45 V (Min) (PN/FTSO3642)
- h_{FE} ... 100 (Min) @ 150 mA, 25 (Min) @ 500 mA (PN/FTSO3643)
- P_G ... 400 mW RF Power Out at 30 MHz
- f_T ... 250 MHz (Min) (PN3643)
- t_{on} ... 60 ns (Max) @ 300 mA, t_{off} ... 150 ns (Max) @ 300 mA
- Complements ... MPS3638/A, PN3644

PACKAGE

PN3641	TO-92
PN3642	TO-92
PN3643	TO-92
FTSO3641	TO-236AA/AB
FTSO3642	TO-236AA/AB
FTSO3643	TO-236AA/AB

ABSOLUTE MAXIMUM RATINGS (Note 1)

Temperatures

Storage Temperature	-55° C to 150° C
Operating Junction Temperature	150° C

Power Dissipation (Notes 2 & 3)

	PN	FTSO
Total Dissipation at 25° C Ambient Temperature	0.625 W	0.350 W*
25° C Case Temperature	1.0 W	

Voltages & Currents		**3641/3**	**3642**
V_{CEO}	Collector to Emitter Voltage (Note 4)	30 V	45 V
V_{CBO}	Collector to Base Voltage	60 V	60 V
V_{EBO}	Emitter to Base Voltage	5.0 V	5.0 V
I_C	Collector Current	500 mA	500 mA

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	3641 MIN	3641 MAX	3642 MIN	3642 MAX	UNITS	TEST CONDITIONS
$BV_{CEO(sus)}$	Collector to Emitter Breakdown Voltage (Notes 4 & 5)	30		45		V	I_C = 10 mA, I_B = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	60		60		V	I_C = 10 μA, V_{BE} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	60		60		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		5.0		V	I_E = 10 μA, I_C = 0

NOTES:
1. These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3. These ratings give a maximum junction temperature of 150° C and (TO-92) junction-to-case thermal resistance of 125° C/W (derating factor of 8.0 mW/° C); junction-to-ambient thermal resistance of 200° C/W (derating factor of 5.0 mW/° C); (TO-236) junction-to-ambient thermal resistance of 357° C/W (derating factor of 2.8 mW/° C).
4. Rating refers to a high current point where collector to emitter voltage is lowest.
5. Pulse conditions: length = 300 μs; duty cycle = 1%.
6. For product family characteristic curves, refer to Curve Set T145.

* Package mounted on 99.5% alumina 8 mm x 8 mm x 0.6 mm.

PN3641/FTSO3641
PN3642/FTSO3642
PN3643/FTSO3643

T-29-23

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	3641 MIN	3641 MAX	3642 MIN	3642 MAX	UNITS	TEST CONDITIONS
I_{CES}	Collector Cutoff Current (Note 5)		50 1.0		50 1.0	nA μA	V_{CE} = 50 V, V_{BE} = 0 V_{CE} = 50 V, V_{BE} = 0, T_A = 65° C
h_{FE}	DC Pulse Current Gain (Note 5)	40 15	120	40 15	120		I_C = 150 mA, V_{CE} = 10 V I_C = 500 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.22		0.22	V	I_C = 150 mA, I_B = 15 mA
C_{ob}	Output Capacitance		8.0		8.0	pF	V_{CB} = 10 V, I_E = 0, f = 140 kHz
h_{fe}	Magnitude of Common Emitter, Short Circuit Small Signal Current Gain	1.5		1.5			I_C = 50 mA, V_{CE} = 5.0 V, f = 100 MHz
G_{PE}	Amplifier Power Gain (test circuit no. 238)	10		10		dB	(Zero Signal) V_{CE} = 15 V, I_C = 0, R_G = 140 Ω, R_L = 260 Ω, f = 30 MHz, P_{IN} = 40 mW
η	Collector Efficiency (test circuit no. 238)	60		60		%	(Zero Signal) V_{CE} = 15 V, I_C = 0, R_G = 140 Ω, R_L = 260 Ω, f = 30 MHz, P_{IN} = 40 mW
t_{on}	Turn On Time (test circuit no. 241)		60		60	ns	$I_C \approx$ 300 mA, $I_{B1} \approx$ 30 mA,
t_{off}	Turn Off Time (test circuit no. 242)		150		150	ns	$I_C \approx$ 300 mA, $I_{B1} \approx I_{B2}$ = 30 mA

SYMBOL	CHARACTERISTIC	3643 MIN	3643 MAX	UNITS	TEST CONDITIONS
$BV_{CEO(sus)}$	Collector to Emitter Breakdown Voltage (Notes 4 & 5)	30		V	I_C = 10 mA, I_B = 0
BV_{CES}	Collector to Emitter Breakdown Voltage	60		V	I_C = 10 μA, V_{BE} = 0
BV_{CBO}	Collector to Base Breakdown Voltage	60		V	I_C = 10 μA, I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	5.0		V	I_E = 10 μA, I_C = 0
I_{CES}	Collector Cutoff Current (Note 5)		50 1.0	nA μA	V_{CE} = 50 V, V_{BE} = 0 V_{CE} = 50 V, V_{BE} = 0, T_A = 65° C
h_{FE}	DC Pulse Current Gain (Note 5)	100 25	300		I_C = 150 mA, V_{CE} = 10 V I_C = 500 mA, V_{CE} = 10 V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage (Note 5)		0.22	V	I_C = 150 mA, I_B = 15 mA

PN3641/FTSO3641
PN3642/FTSO3642 T-29-23
PN3643/FTSO3643

ELECTRICAL CHARACTERISTICS (25° C Ambient Temperature unless otherwise noted) (Note 6)

SYMBOL	CHARACTERISTIC	3643 MIN	3643 MAX	UNITS	TEST CONDITIONS
C_{ob}	Output Capacitance		8.0	pF	V_{CB} = 10 V, I_E = 0, f = 140 kHz
h_{fe}	Magnitude of Common Emitter, Short Circuit Small Signal Current Gain	2.5			I_C = 50 mA, V_{CE} = 5.0 V, f = 100 MHz
G_{PE}	Amplifier Power Gain (test circuit no. 238)	10		dB	(Zero Signal) V_{CE} = 15 V, I_C = 0, R_G = 140 Ω, R_L = 260 Ω, f = 30 MHz, P_{IN} = 40 mW
η	Collector Efficiency (test circuit no. 238)	60		%	(Zero Signal) V_{CE} = 15 V, I_C = 0, R_G = 140 Ω, R_L = 260 Ω, f = 30 MHz, P_{IN} = 40 mW
t_{on}	Turn On Time (test circuit no. 241)		60	ns	$I_C \approx$ 300 mA, $I_{B1} \approx$ 30 mA,
t_{off}	Turn Off Time (test circuit no. 242)		150	ns	$I_C \approx$ 300 mA, $I_{B1} \approx I_{B2}$ = 30 mA